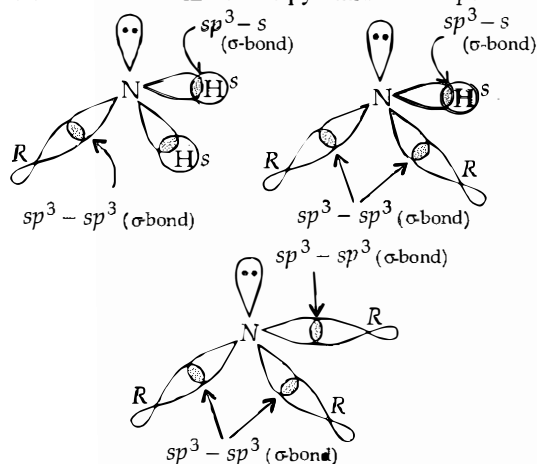


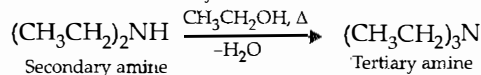
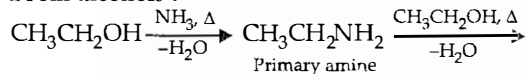
Structure of Amines

- Nitrogen atom of amino group is sp^3 hybridised. Three of these orbitals get involved in sigma bond formation with other atoms whereas fourth orbital contains lone pair of electrons. Thus amines are pyramidal in shape.

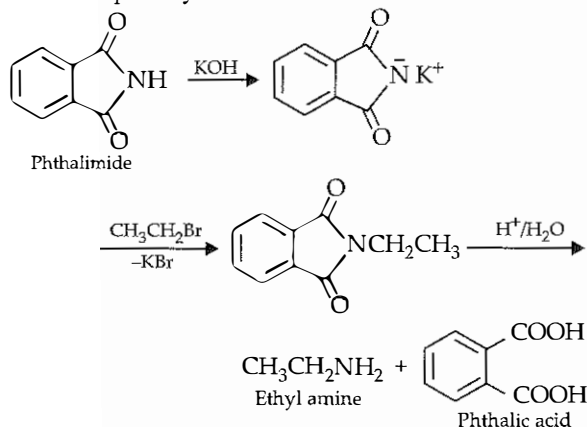


General Methods of Preparation

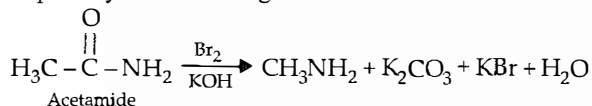
- From alcohols :**



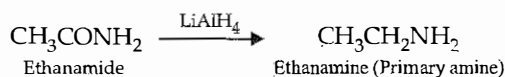
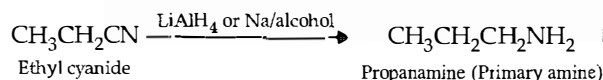
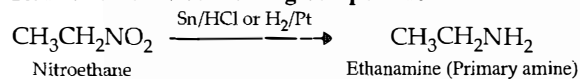
- Gabriel phthalimide synthesis :** For converting alkyl halides to primary amines.



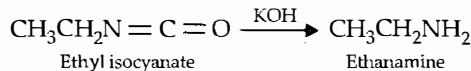
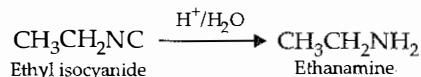
- Hofmann bromamide reaction :** For converting amides to primary amines having one carbon atom less.



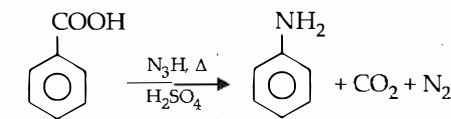
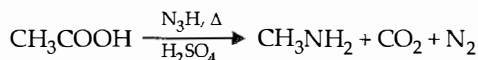
- Reduction of N-containing compounds :**



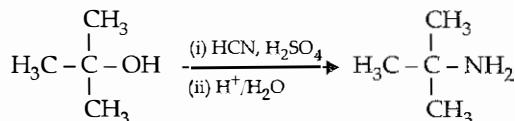
- By hydrolysis of N-containing compounds :**



- Schmidt reaction :** To convert carboxylic acid to amines having one carbon atom less.



- Ritter reaction :**



Physical Properties

- Lower amines are gases and liquids but higher amines are solids.
- Primary and secondary amines have higher boiling points than other organic compounds due to hydrogen bonding.
- Primary and secondary amines are soluble in water due to hydrogen bonding between $-\text{NH}_2$ and H_2O molecules.

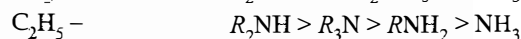
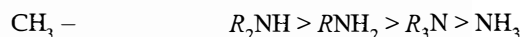
Basic Character

- The amines are basic in nature due to the presence of a lone pair of electron on N-atom of the $-\text{NH}_2$ group, which it can donate to electron deficient compounds. Aliphatic amines are stronger bases than NH_3 because of the +I effect of the alkyl groups. Greater the number of alkyl groups attached to N-atom, higher is the electron density on it and more will be the basicity. Thus the order of basic nature of amines is expected to be $3^\circ > 2^\circ > 1^\circ$, however the observed order is $2^\circ > 1^\circ > 3^\circ$. This is explained on the basis of crowding of N-atom of the amine by alkyl groups which hinders the approach and bonding by a proton, consequently, the electron pair which is present on N is unavailable for donation and hence 3° amines are the weakest bases.

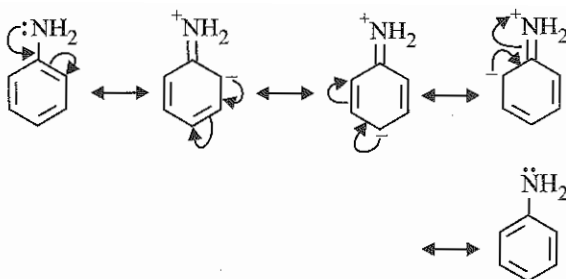
The order of basicity varies with the nature of alkyl group.

Alkyl group

Basic strength



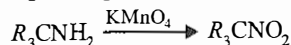
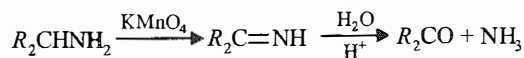
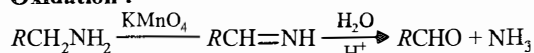
Aniline is a weaker base compared to ammonia. This is because the lone pair of electrons on N-atom of aniline is less available for protonation due to its involvement in conjugation with the π -electrons of the benzene ring.



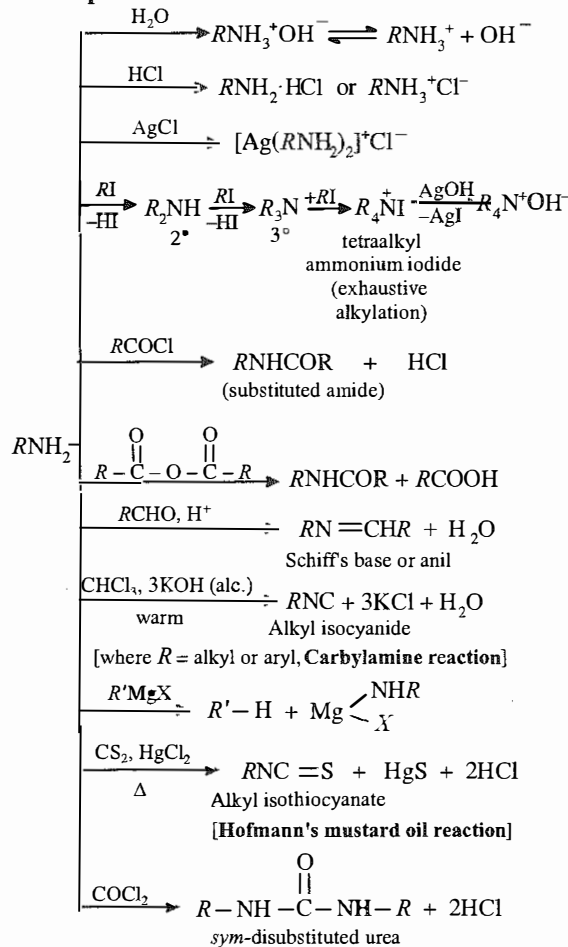
Further the presence of electron withdrawing groups like $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, etc., decreases the basicity while, the presence of electron donating groups like $-\text{OCH}_3$, $-\text{CH}_3$, $-\text{NH}_2$, etc., activates the benzene ring and also increases the basicity.

Chemical Properties

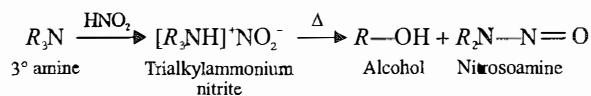
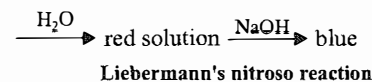
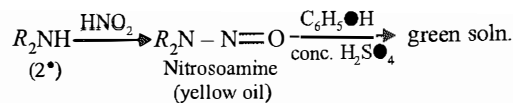
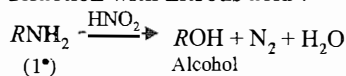
• Oxidation :



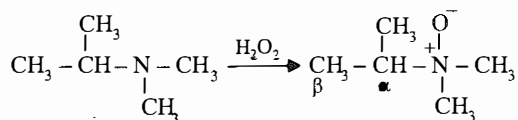
• Electrophilic substitution reactions :



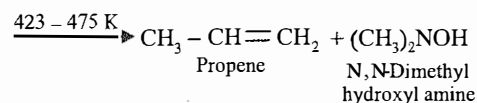
• Reaction with nitrous acid :



• Cope elimination :



Dimethylisopropylamine Dimethylisopropylamine oxide



• Hoffman elimination reaction : In this there is formation of an olefin by pyrolysis of a quaternary ammonium salt.

